

PATENT COOPERATION TREATY

PCT

INTERNATIONAL PRELIMINARY REPORT ON PATENTABILITY

(Chapter II of the Patent Cooperation Treaty)

(PCT Article 36 and Rule 70)

REC'D 23 MAY 2006

Applicant's or agent's file reference 12638290/EJH/ar	FOR FURTHER ACTION		See Form PCT/IPEA/416
International application No. PCT/IB2005/001771	International filing date (<i>day/month/year</i>) 31 March 2005	Priority date (<i>day/month/year</i>) 31 March 2004	
International Patent Classification (IPC) or national classification and IPC Int. Cl. C12N 5/02 (2006.01) C12N 15/29 (2006.01)			
Applicant HEXIMA LIMITED et al			

1. This report is the international preliminary examination report, established by this International Preliminary Examining Authority under Article 35 and transmitted to the applicant according to Article 36.
2. This REPORT consists of a total of 4 sheets, including this cover sheet.
3. This report is also accompanied by ANNEXES, comprising:
 - a. ☒ (*sent to the applicant and to the International Bureau*) a total of 4 sheets, as follows:
 - ☒ sheets of the description, claims and/or drawings which have been amended and are the basis for this report and/or sheets containing rectifications authorized by this Authority (see Rule 70.16 and Section 607 of the Administrative Instructions).
 - ☐ sheets which supersede earlier sheets, but which this Authority considers contain an amendment that goes beyond the disclosure in the international application as filed, as indicated in item 4 of Box No. I and the Supplemental Box.
 - b. ☐ (*sent to the International Bureau only*) a total of (indicate type and number of electronic carrier(s)) , containing a sequence listing and/or table related thereto, in electronic form only, as indicated in the Supplemental Box Relating to Sequence Listing (see Section 802 of the Administrative Instructions).
4. This report contains indications relating to the following items:

<input checked="" type="checkbox"/>	Box No. I	Basis of the report
<input type="checkbox"/>	Box No. II	Priority
<input type="checkbox"/>	Box No. III	Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
<input type="checkbox"/>	Box No. IV	Lack of unity of invention
<input checked="" type="checkbox"/>	Box No. V	Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement
<input type="checkbox"/>	Box No. VI	Certain documents cited
<input type="checkbox"/>	Box No. VII	Certain defects in the international application
<input checked="" type="checkbox"/>	Box No. VIII	Certain observations on the international application

Date of submission of the demand 9 November 2005	Date of completion of this report 10 May 2006
Name and mailing address of the IPEA/AU AUSTRALIAN PATENT OFFICE PO BOX 200, WODEN ACT 2606, AUSTRALIA E-mail address: pct@ipaustalia.gov.au Facsimile No. (02) 6285 3929	Authorized Officer Gareth Cook Telephone No. (02) 6283 2541

Box No. I Basis of the report1. With regard to the **language**, this report is based on:☒ The international application in the language in which it was filed☐ A translation of the international application into _____, which is the language of a translation furnished for the purposes of:☐ international search (under Rules 12.3(a) and 23.1 (b))☐ publication of the international application (under Rule 12.4(a))☐ international preliminary examination (Rules 55.2(a) and/or 55.3(a))2. With regard to the **elements** of the international application, this report is based on (*replacement sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to this report*):☐ the international application as originally filed/furnished☒ the description:pages **1-54** as originally filed/furnished

pages* received by this Authority on _____ with the letter of

pages* received by this Authority on _____ with the letter of

☒ the claims:

pages as originally filed/furnished

pages* as amended (together with any statement) under Article 19

pages* **55-58** received by this Authority on **21 April 2006** with the letter of **21 April 2006**

pages* received by this Authority on _____ with the letter of

☒ the drawings:pages **1/12-12/12** as originally filed/furnished

pages* received by this Authority on _____ with the letter of

pages* received by this Authority on _____ with the letter of

☐ a sequence listing and/or any related table(s) - see Supplemental Box Relating to Sequence Listing.3. ☐ The amendments have resulted in the cancellation of:☐ the description, pages☐ the claims, Nos.☐ the drawings, sheets/figs☐ the sequence listing (*specify*):☐ any table(s) related to the sequence listing (*specify*):4. ☐ This report has been established as if (some of) the amendments annexed to this report and listed below had not been made, since they have been considered to go beyond the disclosure as filed, as indicated in the Supplemental Box (Rule 70.2(c)).☐ the description, pages☐ the claims, Nos.☐ the drawings, sheets/figs☐ the sequence listing (*specify*):☐ any table(s) related to the sequence listing (*specify*):

* If item 4 applies, some or all of those sheets may be marked "superseded."

Box No. V Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1. Statement

Novelty (N)	Claims 1-32	YES
	Claims	NO
Inventive step (IS)	Claims 1-32	YES
	Claims	NO
Industrial applicability (IA)	Claims 1-32	YES
	Claims	NO

2. Citations and explanations (Rule 70.7)

NOVELTY (N) AND INVENTIVE STEP (IS)

Claims 1-32 meet the criteria set forth in PCT Article 33(2) for novelty and PCT Article 33(3) for inventive step. The prior art documents cited in the International Search report do not teach or suggest using a hydrophobic fraction of AGP isolated from embryogenic tissue to foster somatic embryogenesis. Thus claims 1-22 and 28 are considered to be novel and inventive. The prior art documents cited in the International Search report do not teach or suggest using the phytocyanin-like domain of embryogenic AGPs. Thus claims 23-27 and 29-32 are considered to be novel and inventive.

INDUSTRIAL APPLICABILITY (IA)

Claims 1-32 meet the requirements of the PCT in respect to Industrial Applicability.

Box No. VIII Certain observations on the international application

The following observations on the clarity of the claims, description, and drawings or on the question whether the claims are fully supported by the description, are made:

The new claims filed on the 21 April 2006 suffer from the same lack of clarity as the claims as originally filed. That is, there remains a lack of clarity with regard to the term "embryogenic AGP" as it appears in the description and in the claims (claims 1-27 and 29-32). In particular the description gives contradictory statements as to the full scope of the term. At p14, lines 21-26, the application has limited the term "embryogenic AGP" to describe AGP that is derived from embryogenic callus. In contrast, at p16, lines 27-28, the term "embryogenic AGP" is not limited to being derived from embryogenic callus. Therefore it is not clear what the scope of the term is.

If the applicant wishes the term "embryogenic AGP" to have a particular meaning distinct from the ordinary meaning to the person skilled in the art, the applicant should make clear statements to that effect.

For the purposes of this report, the term "embryogenic AGP" has been construed as "AGP(s) derived from embryogenic tissue generally, e.g. embryogenic suspension cultures, seeds, etc."

CLAIMS:

1. A method for fostering somatic embryogenic competence of a plant cell or tissue comprising contacting said plant cell or tissue with a pro-embryogenic arabinosylated protein (AGP) composition comprising a hydrophobic fraction of embryogenic AGP and maintaining the cell or tissue in culture to allow the cell or tissue to undergo somatic embryogenesis.
2. The method of Claim 1 wherein the plant cell or tissue is of cotton.
3. The method of Claim 1 or 2 wherein the plant cell or tissue is selected from the group consisting of Upland cotton, Pima cotton, Egyptian cotton, Sea Island cotton, *G. hirsutum*, *G. barbadense*, tree cotton, Creole cotton, Levant cotton, Sturt's desert rose cotton, Thurber's cotton and Hawaii cotton.
4. The method of any of Claims 1 to 3 wherein the plant cell or tissue is of an elite cotton line.
5. The method of any of Claims 1 to 4 wherein the pro-embryogenic AGP composition comprises embryogenic AGP of a cotton variety.
6. The method of any of Claims 1 to 5 wherein said AGP composition comprises AGP hydrophobic peak #1 from embryogenic callus from a cotton variety selected from the group consisting of Coker 315, Siokra 1-4, and Sicala 40 at a concentration between about 0.008 and about 0.8 mg/L, and wherein said plant cell is of a cotton variety that is recalcitrant to somatic embryogenesis.
7. The method of Claim 5 wherein the pro-embryogenic AGP composition comprises embryogenic AGP selected from the group consisting of de-glycosylated AGP and de-arabinosylated AGP.

8. The method of Claim 5 wherein the pro-embryogenic AGP is a protein having the amino acid sequence of SEQ ID NO:25.
9. The method of Claim 5 wherein the pro-embryogenic AGP is a protein having the amino acid sequence of SEQ ID NO:26.
10. The method of Claim 8 or 9 wherein the protein is trypsin-digested.
11. A method for regenerating a plant comprising:
 - a) harvesting a plant cell or tissue from a first plant;
 - b) contacting said plant cell or tissue with an AGP composition comprising a hydrophobic fraction of embryogenic AGP effective for fostering somatic embryogenic competence; and
 - c) regenerating a second plant from said plant cell or tissue of step (b).
12. The method of Claim 11 comprising, prior to step (b), the step of transforming said plant cell or tissue whereby a transformed plant is regenerated.
13. The method of Claim 11 or 12 wherein the plant is cotton.
14. The method of Claim 13 wherein the cotton plant is a variety selected from the group consisting of Upland cotton, Pima cotton, Egyptian cotton, Sea Island cotton, *G. hirsutum*, *G. barbadense*, tree cotton, Creole cotton, Levant cotton, Sturt's desert rose cotton, Thurber's cotton and Hawaii cotton.
15. The method of Claim 13 wherein the cotton plant is of an elite cotton line.
16. The method of any of Claims 13 to 15 wherein the AGP composition comprises an embryogenic AGP of a cotton variety.

17. The method of Claim 16 wherein the AGP composition effective for fostering somatic embryogenesis comprises pro-embryogenic AGP selected from the group consisting of de-glycosylated and de-arabinosylated AGP.
18. The method of Claim 17 wherein the pro-embryogenic AGP is a protein having the amino acid sequence of SEQ ID NO:25.
19. The method of Claim 17 wherein the pro-embryogenic AGP is a protein having the amino acid sequence of SEQ ID NO:26.
20. The method of Claim 18 or 19 wherein the protein is trypsin-digested.
21. A pro-embryogenic AGP composition comprising a hydrophobic fraction of embryogenic AGP of cotton.
22. The composition of Claim 21 wherein the AGP is de-glycosylated or de-arabinosylated.
23. A pro-embryogenic AGP composition comprising a protein comprising a phytoeyanin-like domain of an embryogenic AGP.
24. A pro-embryogenic AGP composition according to Claim 23 comprising a protein having the amino acid sequence of SEQ ID NO:25.
25. The composition of Claim 24 comprising a trypsin digest of the protein of SEQ ID NO:25.
26. A pro-embryogenic AGP composition according to Claim 23 comprising a protein having the amino acid sequence of SEQ ID NO:26.

27. The composition of Claim 26 comprising a trypsin digest of the protein of SEQ ID NO:25.
28. A method for making an AGP composition useful for fostering somatic embryogenic competence comprising:
 - a) providing embryogenic callus; and
 - b) harvesting AGP from said embryogenic callus and fractionating the AGP into hydrophilic and hydrophobic fractions and retaining the hydrophobic fraction.
29. A method of making pro-embryogenic AGP by expressing a protein comprising a phytoeyanin-like domain of an embryogenic AGP.
30. The method of Claim 29 wherein the protein has the amino acid sequence of SEQ ID NO:25.
31. The method of Claim 29 wherein the protein has the amino acid sequence of SEQ ID NO:26.
32. The method of Claim 29 or 30 comprising the added step of contacting the expressed protein with trypsin.